

CLAIMS

What is claimed is:

1. A method to retrieve elevation data, the method comprising:
  - 2 locating a first compressed portion of a Digital Elevation Model (DEM)  
using a first index, the Digital Elevation Model comprising a  
4 plurality of compressed portions which includes the first  
compressed portion, the first index pointing to a storage location  
6 where the first compressed portion is stored; and  
decompressing the first compressed portion to retrieve first elevation data  
8 for at least one sample point in the Digital Elevation Model.
2. A method as in claim 1 wherein the plurality of compressed portions are  
2 stored in one of:
  - a) a Memory Mapped File (MMF);
  - 4 b) Random Access Memory (RAM); and
  - c) a file in a file system on a digital processing system.
3. A method as in claim 2 wherein the plurality of compressed portions are  
2 portions of compressed profiles in a first tile of the Digital Elevation  
Model.
4. A method as in claim 3 further comprising:
  - 2 identifying the first tile, the first tile containing a first location and being  
one of a plurality of tiles in an area of the Digital Elevation  
4 Model; and

- identifying a first profile that is in the vicinity of the first location, the  
6 first compressed portion being a portion of the first profile.
5. A method as in claim 4 further comprising:  
2 identifying the area, the area containing the first location and being one of  
a plurality of areas of the Digital Elevation Model.
6. A method as in claim 1 wherein said decompressing the first compressed  
2 portion comprises:  
run length decoding the first compressed portion to generate scaled  
4 elevation data;  
inverse scaling the scaled elevation data to generate normalized elevation  
6 data; and  
adding a reference elevation to the normalized elevation data to generate  
8 the first elevation data.
7. A method as in claim 1 further comprising:  
2 identifying a plurality of sample points in the vicinity of a first location;  
retrieving elevations of the plurality of sample points from the Digital  
4 Elevation Model; and  
computing an elevation of the first location from an interpolation using  
6 the elevations of the plurality of sample points.
8. A method as in claim 7 further comprising:

2 performing a coordinate transformation to express a horizontal position of  
the first location in a coordinate system used by the Digital  
4 Elevation Model.

9. A method as in claim 7 further comprising:  
2 providing the elevation of the first location to a Position Determination  
Entity to perform altitude aiding in a positioning system.

10. A method as in claim 9 wherein said computing the elevation of the first  
2 location comprises:  
performing a coordinate transformation such that the elevation of first  
4 location is expressed in a coordinate system used by the Position  
Determination Entity.

11. A method to store elevation data, the method comprising:  
2 compressing elevation data of a first portion of a Digital Elevation Model  
(DEM) to generate first compressed elevation data;  
4 storing the first compressed elevation data in a storage location pointed to  
by a first index; and  
6 storing the first index.

12. A method as in claim 11 further comprising:  
2 storing parameters required for determining whether or not a location is  
in the first portion of the Digital Elevation Model.

13. A method as in claim 11 further comprising:  
2 storing data specifying a coordinate system used to represent the  
elevation data of the first portion of the Digital Elevation Model.
14. A method as in claim 11 wherein said compressing the elevation data of  
2 the first portion comprises:  
subtracting a reference elevation from the elevation data of the first  
4 portion of the Digital Elevation Model (DEM) to generate  
normalized elevation data; and  
6 scaling the normalized elevation data to generate scaled elevation data.
15. A method as in claim 14 wherein said compressing the elevation data of  
2 the first portion further comprises:  
run length encoding the scaled elevation data to generate the first  
4 compressed elevation data.
16. A method as in claim 11 wherein the first portion is a profile of the  
2 Digital Elevation Model.
17. A method as in claim 11 further comprising:  
2 dividing an area of the Digital Elevation Model into a plurality of tiles;  
and  
4 storing parameters required for determining whether or not a location is  
in one of the plurality of tiles;

6 wherein the first portion is one of a plurality of profiles in one of the  
plurality of tiles.

18. A method as in claim 17 further comprising:

2 dividing the Digital Elevation Model into a plurality of areas; and  
storing parameters required for determining whether or not a location is  
4 in one of the plurality of areas.

19. A machine readable media containing executable computer program

2 instructions which when executed by a digital processing system cause  
said system to perform a method to retrieve elevation data, the method  
4 comprising:

6 locating a first compressed portion of a Digital Elevation Model (DEM)  
using a first index, the Digital Elevation Model comprising a  
plurality of compressed portions which includes the first  
8 compressed portion, the first index pointing to a storage location  
where the first compressed portion is stored; and  
10 decompressing the first compressed portion to retrieve first elevation data  
for at least one sample point in the Digital Elevation Model.

20. A media as in claim 19 wherein the plurality of compressed portions are  
2 stored in one of:

- 4 a) a Memory Mapped File (MMF);  
b) Random Access Memory (RAM); and  
c) a file in a file system on a digital processing system.

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21. A media as in claim 20 wherein the plurality of compressed portions are  
2 portions of compressed profiles in a first tile of the Digital Elevation  
Model.
22. A media as in claim 21 wherein the method further comprises:  
2 identifying the first tile, the first tile containing a first location and being  
one of a plurality of tiles in an area of the Digital Elevation  
4 Model; and  
identifying a first profile that is in the vicinity of the first location, the  
6 first compressed portion being a portion of the first profile.
23. A media as in claim 22 wherein the method further comprises:  
2 identifying the area, the area containing the first location and being one of  
a plurality of areas of the Digital Elevation Model.
24. A media as in claim 19 wherein said decompressing the first compressed  
2 portion comprises:  
run length decoding the first compressed portion to generate scaled  
4 elevation data;  
inverse scaling the scaled elevation data to generate normalized elevation  
6 data; and  
adding a reference elevation to the normalized elevation data to generate  
8 the first elevation data.

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25. A media as in claim 19 wherein the method further comprises:  
2 identifying a plurality of sample points in the vicinity of a first location;  
retrieving elevations of the plurality of sample points from the Digital  
4 Elevation Model; and  
computing an elevation of the first location from an interpolation using  
6 the elevations of the plurality of sample points.
26. A media as in claim 25 wherein the method further comprises:  
2 performing a coordinate transformation to express a horizontal position of  
the first location in a coordinate system used by the Digital  
4 Elevation Model.
27. A media as in claim 25 wherein the method further comprises:  
2 providing the elevation of the first location to a Position Determination  
Entity to perform altitude aiding in a positioning system.
28. A media as in claim 27 wherein said computing the elevation of the first  
2 location comprises:  
performing a coordinate transformation such that the elevation of first  
4 location is expressed in a coordinate system used by the Position  
Determination Entity.
29. A machine readable media containing executable computer program  
2 instructions which when executed by a digital processing system cause

said system to perform a method to store elevation data, the method  
4 comprising:

compressing elevation data of a first portion of a Digital Elevation Model  
6 (DEM) to generate first compressed elevation data;  
storing the first compressed elevation data in a storage location pointed to  
8 by a first index; and  
storing the first index.

30. A media as in claim 29 wherein the method further comprises:

2 storing parameters required for determining whether or not a location is  
in the first portion of the Digital Elevation Model.

31. A media as in claim 29 wherein the method further comprises:

2 storing data specifying a coordinate system used to represent the  
elevation data of the first portion of the Digital Elevation Model.

32. A media as in claim 29 wherein said compressing the elevation data of  
2 the first portion comprises:

subtracting a reference elevation from the elevation data of the first  
4 portion of the Digital Elevation Model (DEM) to generate  
normalized elevation data; and

6 scaling the normalized elevation data to generate scaled elevation data.

33. A media as in claim 32 wherein said compressing the elevation data of  
2 the first portion further comprises:



run length encoding the scaled elevation data to generate the first  
compressed elevation data.

34. A media as in claim 29 wherein the first portion is a profile of the Digital  
Elevation Model.

35. A media as in claim 29 wherein the method further comprises:  
dividing an area of the Digital Elevation Model into a plurality of tiles;  
and  
storing parameters required for determining whether or not a location is  
in one of the plurality of tiles;  
wherein the first portion is one of a plurality of profiles in one of the  
plurality of tiles.

36. A media as in claim 35 wherein the method further comprises:  
dividing the Digital Elevation Model into a plurality of areas; and  
storing parameters required for determining whether or not a location is  
in one of the plurality of areas.

37. A digital processing system to retrieve elevation data, the digital  
processing system comprising:  
means for locating a first compressed portion of a Digital Elevation  
Model (DEM) using a first index, the Digital Elevation Model  
comprising a plurality of compressed portions which includes the

6 first compressed portion, the first index pointing to a storage  
location where the first compressed portion is stored; and  
8 means for decompressing the first compressed portion to retrieve first  
elevation data for at least one sample point in the Digital  
10 Elevation Model.

38. A digital processing system as in claim 37 wherein the plurality of  
2 compressed portions are stored in one of:  
a) a Memory Mapped File (MMF);  
4 b) Random Access Memory (RAM); and  
c) a file in a file system on the digital processing system.

39. A digital processing system as in claim 38 wherein the plurality of  
2 compressed portions are portions of compressed profiles in a first tile of  
the Digital Elevation Model.

40. A digital processing system as in claim 39 further comprising:  
2 means for identifying the first tile, the first tile containing a first location  
and being one of a plurality of tiles in an area of the Digital  
4 Elevation Model; and  
means for identifying a first profile that is in the vicinity of the first  
6 location, the first compressed portion being a portion of the first  
profile.

41. A digital processing system as in claim 40 further comprising:

- 2 means for identifying the area, the area containing the first location and  
being one of a plurality of areas of the Digital Elevation Model.
42. A digital processing system as in claim 37 wherein said means for  
2 decompressing the first compressed portion comprises:  
means for run length decoding the first compressed portion to generate  
4 scaled elevation data;  
means for inverse scaling the scaled elevation data to generate  
6 normalized elevation data; and  
means for adding a reference elevation to the normalized elevation data to  
8 generate the first elevation data.
43. A digital processing system as in claim 37 further comprising:  
2 means for identifying a plurality of sample points in the vicinity of a first  
location;  
4 means for retrieving elevations of the plurality of sample points from the  
Digital Elevation Model; and  
6 means for computing an elevation of the first location from an  
interpolation using the elevations of the plurality of sample points.
44. A digital processing system as in claim 43 further comprising:  
2 means for performing a coordinate transformation to express a horizontal  
position of the first location in a coordinate system used by the  
4 Digital Elevation Model.

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45. A digital processing system as in claim 43 further comprising:  
2 means for providing the elevation of the first location to a Position  
Determination Entity to perform altitude aiding in a positioning  
4 system.
46. A digital processing system as in claim 45 wherein said means for  
2 computing the elevation of the first location comprises:  
means for performing a coordinate transformation such that the elevation  
4 of first location is expressed in a coordinate system used by the  
Position Determination Entity.
47. A digital processing system to store elevation data, the digital processing  
2 system comprising:  
means for compressing elevation data of a first portion of a Digital  
4 Elevation Model (DEM) to generate first compressed elevation  
data;  
6 means for storing the first compressed elevation data in a storage location  
pointed to by a first index; and  
8 means for storing the first index.
48. A digital processing system as in claim 47 further comprising:  
2 means for storing parameters required for determining whether or not a  
location is in the first portion of the Digital Elevation Model.

49. A digital processing system as in claim 47 further comprising:  
2 means for storing data specifying a coordinate system used to represent  
the elevation data of the first portion of the Digital Elevation  
4 Model.
50. A digital processing system as in claim 47 wherein said means for  
2 compressing the elevation data of the first portion comprises:  
means for subtracting a reference elevation from the elevation data of the  
4 first portion of the Digital Elevation Model (DEM) to generate  
normalized elevation data; and  
6 means for scaling the normalized elevation data to generate scaled  
elevation data.
51. A digital processing system as in claim 50 wherein said means for  
2 compressing the elevation data of the first portion further comprises:  
means for run length encoding the scaled elevation data to generate the  
4 first compressed elevation data.
52. A digital processing system as in claim 47 wherein the first portion is a  
2 profile of the Digital Elevation Model.
53. A digital processing system as in claim 47 further comprising:  
2 means for dividing an area of the Digital Elevation Model into a plurality  
of tiles; and

4 means for storing parameters required for determining whether or not a  
location is in one of the plurality of tiles;  
6 wherein the first portion is one of a plurality of profiles in one of the  
plurality of tiles.

54. A digital processing system as in claim 53 further comprising:

2 means for dividing the Digital Elevation Model into a plurality of areas;  
and

4 means for storing parameters required for determining whether or not a  
location is in one of the plurality of areas.

55. A machine readable media containing a data stream representing a Digital  
2 Elevation Model, the data stream being produced by a method  
comprising:

4 compressing elevation data of a first portion of a Digital Elevation Model  
(DEM) to generate first compressed elevation data;

6 storing the first compressed elevation data in a storage location pointed to  
by a first index as part of the data stream; and

8 storing the first index as part of the data stream.

56. A media as in claim 55 wherein the method further comprises:

2 storing parameters required for determining whether or not a location is  
in the first portion of the Digital Elevation Model as part of the  
4 data stream.

57. A media as in claim 55 wherein the method further comprises:

storing data specifying a coordinate system used to represent the  
elevation data of the first portion of the Digital Elevation Model  
as part of the data stream.

58. A media as in claim 55 wherein said compressing the elevation data of  
the first portion comprises:

subtracting a reference elevation from the elevation data of the first  
portion of the Digital Elevation Model (DEM) to generate  
normalized elevation data; and  
scaling the normalized elevation data to generate scaled elevation data.

59. A media as in claim 58 wherein said compressing the elevation data of  
the first portion further comprises:

run length encoding the scaled elevation data to generate the first  
compressed elevation data.